



A DOE SUCCESS: Deactivation and Decommissioning at the Chicago Pile Number 5 (CP-5) Reactor Facility

The Project: Hundreds of contaminated and non-operational facilities exist at DOE sites across the United States that must undergo various levels of decontamination (removal of contaminants from materials, equipment, and structures) and dismantlement (taking things apart and processing the resultant waste materials for disposition). Many of these facilities represent high-risk areas due to high radiation levels, the presence of hazardous materials or the industrial hazards associated with dismantlement of massive equipment.

During FY 1997, several remote operation technologies were deployed at the Argonne National Laboratory (ANL) Chicago Pile No. 5 (CP-5) reactor for use in the dismantlement of the CP-5 reactor. Two major remote systems were implemented at CP-5: the Dual Arm Work Platform (DAWP), and remote reduced-swing control of the existing polar crane. The DAWP is a dual manipulator system packaged specifically for overhead crane deployment to allow maximum access to the reactor structure and the entire reactor room.

The modifications to the existing CP-5 polar crane consisted of providing remote operation capability, the installation of a remotely controlled rotation capability for the crane hook, and implementation of swing-free control capability. The swing-free control capability was developed for use in material or waste handling tasks associated with activities where suspended loads are moved using overhead cranes.

The Impact: These remote systems were integrated into the operational work and were the baseline systems for the performance of the remote operations required during the reactor dismantlement. ANL D&D staff were trained in the operation of these systems and were the primary remote operators. This represents true transfer of the technology into actual field operation.

Key operational results from the CP-5 deployment were:

- The DAWP was used to remotely remove 60,000 pounds of graphite, 2000 pounds of carbon steel, 1700 pounds of aluminum, 1400 pounds of lead, and 620 pounds of boral from the CP-5 reactor. When radiation levels from components removed from the reactor proved to be higher than originally expected, the DAWP was used to size-reduce and package the components in shielded containers, further reducing worker exposure very significantly. Parametric measurements also showed production rate increases in various activities from 10 to 56 percent and cost reductions of 24 to 43 percent.
- Passive swing-reducing technology was shown to reduce swing time by 60 percent, thereby increasing safety and throughput when handling suspended loads.

Further Advances through a RIM Initiative:

The remote systems deployed at CP-5 provided good remote functionality and removed workers from the hazardous environment, but these systems were fundamentally teleoperated systems with little or no automated capabilities. The RIM Initiative will provide the technologies to increase

the level of automation within systems such as the DAWP to increase their efficiency and productivity. Currently the benefit of remote systems is generally viewed in terms of reduced worker exposure. RIM technologies will produce more productive remote systems that will increase the cost benefit of these systems as well. RIM research into advanced sensing and controls techniques will enable these systems to perform more complicated tasks with increased accuracy and efficiency. Research into human-machine interfaces, along with increased system capabilities, will relieve the operator from tedious, continuous, direct control of the system, allowing the operator to function in a more supervisory role. Increases in simulation and modeling capabilities will provide enhanced planning and training capabilities, which in turn also increase system productivity.



In the environmental management site cleanup area, the highly capable systems resulting from RIM research will be necessary to address, in a cost effective manner, many of the most hazardous activities which have yet to be addressed.

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